

Connecting device for a pipe or the like

The invention relates to a connecting device for a pipe or the like fluid conduit, with a coupling body and a clamping collar which can be set into a substantially cylindrical recess of the coupling body in an axially inner starting position and into which, for example after such setting into the recess, one end of the pipe to be connected can be slid, for example until its front-side abuts a stop of the coupling body, the clamping collar comprising at its inner end at least one radially displaceable arresting tongue, which, when the pipe, and therewith the clamping collar, is slid back in the direction of the recess inlet, for example under the pressure building up in the pipe coupling, up into an axially outer arresting position, can be pressed radially inwardly and with its inner side into engagement with the outer wall surface of the pipe through the cooperation of the outer side of the arresting tongue with a first slope, radially slanting in the direction of the recess inlet, of the inner wall surface of the coupling body. In this way a plug connection between the pipe or the like fluid conduit can be established and detached simply and rapidly.

In Fig. 1 is depicted in section such a commercially available connecting device in section. In order to produce tightness between connecting devices, between the outer wall surface of the pipe and the inner wall surface of the coupling body an O-ring seal is provided in the recess of the coupling body at the front side of the inner end of the clamping collar. To detach the plug connection, the clamping collar can be slid for example with the aid of an outer flange from the axially outer arresting position, depicted in Fig. 1, further into the recess of the coupling body up into its axially inner starting position, whereby the arresting tongues of the clamping collar spread

out of their radially inwardly pressed position due to the cooperation with the sealing ring and, optionally, their own reset force and can release again the pipe end. It has been found that, on the one hand, into the gaps between pipe end and clamping collar as well as between clamping collar and coupling body moisture and dirt can penetrate from the outside, which makes detaching the plug connection difficult and, on the other hand, when producing and detaching the plug connection scratches and the like damages are generated in the outer wall surface of the pipe end, whereby leaks occur under the fluid pressure obtaining in the connecting device. Based on the recognition that these problems occur in practice, the apparent solution was to additionally seal, on the one hand, the pipe end against the clamping collar and, on the other hand, the clamping collar against the coupling body adjacent to the recess inlet, as has also been proposed in EP 1 143 185 A1, with the aid of two O-ring seals. Of these two O-rings one is provided between clamping collar and inner wall surface of the coupling body and one between clamping collar and outer wall surface of the pipe.

However, one problem is still the reliable spreading open of the arresting tongues when the clamping collar is slid in from the arresting position depicted in Fig. 1, since, on the one hand, the compliance of the sealing ring at the front side of the clamping collar after ageing and, on the other hand, in the absence of sufficient resilient elasticity, the reset force of the resilient tongues does not ensure adequate spreading out force.

The invention therefore addresses the problem of implementing a connecting device of the above described type such, that with simple means the reliable formation and detachment of the plug connection is ensured.

This problem is essentially resolved for example according to the invention thereby that the coupling body has at the front side of the clamping collar a second slope radially slanting toward the recess inlet. When the clamping collar is slid from the axially outer arresting position into the axially inner starting position, this slope cooperates with the front side end of the at least one arresting tongue as the ramp-up slope in order to spread it radially.

According to the invention during the spreading-open process metal faces act mechanically on one another, which determine the spreading-open process securely and reliably. It has unexpectedly been found that the O-ring seal considered necessary according to prior art according to Fig. 1 and according to EP 1 141 185 A1 at the front side of the clamping collar can be omitted, whereby for the improved functioning capability of the connecting device according to the invention this structural component is additionally also saved.

Spreading open the arresting tongues for the purpose of detaching the plug connection can still be further improved thereby that the front side end of the at least one arresting tongue comprises an identically directed tongue slope cooperating with the second slope of the coupling body.

In the event an additional sealing is necessary, the clamping collar adjacent to the recess inlet of the coupling body can be sealed, for example by means of two O-ring seals, against the inner wall surface of the coupling body and/or the outer wall surface of the pipe.

For the purpose of reliable arresting, it can further be of advantage to provide the at least one arresting tongue with a sharp edge on its side facing the outer wall surface

of the pipe.

In simple implementation of the coupling piece [*sic: body*] the first slope is formed by an annular bead encircling on the inner wall surface of the coupling body.

Of particular advantage for the reliable arresting and sealing is the disposition of two or more arresting tongues uniformly distributed over the circumference of the clamping collar.

In order to be able to press the clamping collar more simply from the axially outer arresting position into the axially inner starting position in the direction toward the interior of the recess, the clamping collar is usefully equipped with a circumferential flange at its outer end.

Independently of the previously described concept for a solution, in a connecting device of the above cited, thus known, type, but also together with it, it can be provided that the clamping collar is divided into an inner function section with the at least one arresting tongue, which, when it is slid from the axially outer arresting position into the axially inner starting position, is spread radially outwardly for the release of the pipe, and into an outer actuation section, and between the front sides, facing one another, of function section and actuation section a seal is disposed, implemented for example as an O-ring seal, which provides sealing radially outwardly against the inner wall surface of the coupling body and radially inwardly against the outer wall surface of the pipe.

Hereby is solved the problem in the connecting device according to EP 1 143 185 A1 that, in addition to the seal disposed at the front-side before the clamping collar,

two further O-ring seals are required for sealing the coupling interior axially outwardly.

With the present proposal in the invention therewith a special simplification of the structure is attained, which comes to bear in particular when the seal disposed at the front side of the clamping collar is also omitted and the spreading-open takes place with the aid of metal faces acting on one another.

In order for the actuation section to be retained in the recess of the coupling body, the former can comprise at its axially inner end at least one radially displaceable latching tongue, which with a radially outwardly directed projection engages into a groove open radially inwardly, and implemented for example as circumferential groove, in the inner wall surface of the coupling body.

The circumferential groove is preferably of a width, which permits the axial displacement of the actuation section to such an extent that the function section can be slid back and forth between its axially inner starting position and its axially outer arresting position.

For the reliable seating of the actuation section in the recess of the coupling body, two or more latching tongues are advantageously distributed uniformly over the circumference of the actuation section.

Within the scope of this inventive concept it is further proposed to fabricate the function section of a metal and the actuation section of an elastically compliant material, such as a synthetic material, such that the latching tongues can be lent the requisite resilient elasticity. In this embodiment of the invention the circumferential

flange can be provided on the actuation section, such that a simple displacement of the actuation section via the O-ring seal and arresting [*sic: function*] section [of] the clamping collar is possible from the axially outer arresting position into the axially inner starting position (release position).

Further aims, characteristics, advantages and application feasibilities are evident based on the following description of embodiment examples in conjunction with the drawing. All described and/or graphically represented characteristics by themselves or in any combination form therein the subject matter of the invention independently of their summary in individual claims or their reference back.

In the drawing depict:

- Fig. 1 in longitudinal section a connecting device of prior art, on which the invention builds,
- Fig. 2 in partial section an embodiment example of a connecting device comprising the invention, and
- Fig. 3 a representation corresponding to Fig. 2 for another path of the invention toward a solution.

In the following the invention will be explained in further detail in its distinctive aspects in conjunction with the connecting devices depicted in Fig. 2 and 3. It may be stated in advance that in Fig. 1 [*sic*] the same reference symbols are utilized for corresponding structural parts of the connecting device known from prior art.

The connecting device according to Fig. 2 serves for the plug connection of a pipe 4

or the like fluid conduit with a preferably metallic coupling body 1 such, that through the connecting device a fluid, thus a gaseous or liquid medium, can be conducted without leakages occurring. The coupling body 1 has a substantially cylindrical recess 3 extending up to an inner shoulder serving as a stop 5 for the end of the pipe 4, which is adjoined by a channel section 22 for the passage of the fluid. The channel section 22 passes through a connection piece 23 implemented for example as a threaded connection piece.

The connecting device comprises further an, also preferably metallic, clamping collar 2, which can be set into the recess 3 from the direction of the recess inlet 7. The clamping collar 2 comprises at its axially inner end arresting tongues 6 distributed over its circumference or separated from one another by (not visible) axially parallel slots and optionally resiliently elastic. During the sliding-in these arresting tongues 6 can be slid with their broadened front-side ends 13 under radial compression past an annular bead 21 implemented on the inner wall surface 10 of the coupling body until the widened front-side ends 13 come to lie in a widening behind an encircling slope 9 radially slanting in the direction of the recess inlet 7. In this way coupling body 1 and clamping collar 2 form a unit which can only be detached by applying force. The end of pipe 4 can subsequently be slid into the cylindrical recess of the clamping collar 2 up to the stop 5 of coupling body 1. When there is a fluid pressure build-up in the connecting device, the end of pipe 4 is minimally displaced from the axially inner starting position on stop 5 in the direction of the recess inlet 7 into an axially outer arresting position depicted in Fig. 2, in which there is a gap 24 between the front side of the end of pipe 4 and stop 5. Pipe 4 therein entrains the clamping collar 2, whereby the outer side 8 of the widened front-side ends 13 of the arresting tongues 6 are pressed under the cooperation with the first slope 9 radially inwardly and in this way secure in position the end of pipe 4. For this purpose the arresting tongues

6 have a sharp edge 16 on their inner side facing the outer wall surface 11 of pipe 4.

As is evident in Fig. 2 the coupling body 1 comprises in this embodiment example at the front side of the clamping collar 2 an encircling second slope 2 radially slanting toward the recess inlet 7, which slope during the sliding-in of the clamping collar from the axially outer arresting position depicted in Fig. 2 into the originally assumed axially inner starting position cooperates with the front-side end 13 of the arresting tongues 6 implemented as a ramp-up slope in order to spread open the arresting tongues 6. This special embodiment of the invention is utilized for the simple detachment of the plug connection. Fig. 2 shows further that for the securement of the function, the widened front-side ends 13 of each arresting tongue 6 comprise an identically directed tongue slope 17 cooperating with the second encircling slope 12 of the coupling body 1. In comparison with Fig. 1, it can be seen that the front-side sealing ring 20 provided according to prior art has been omitted.

However, for the inlet-side sealing the clamping collar 2 adjacent to the recess inlet 7 of the coupling body 2 [*sic*: 1] can be sealed, for example by means of particular O-ring seals 14, 15, against the inner wall surface 10 of the coupling body 1 and/or the outer wall surface 11 of the pipe 4. Hereby the penetration of moisture and dirt from the outside and the escape of fluid from the connecting device to the outside is additionally avoided.

A circumferential flange 18 provided at the outer end of clamping collar 2 facilitates the sliding of the clamping collar 2 into recess 3 from the axially outer arresting position depicted in Fig. 2 inwardly into the axially inner starting position, in which the end of pipe 4 is again released from the arresting tongues 6.

The connecting device depicted in Fig. 3 follows up a further inventive concept separate from that described so far, but also applicable together with it. In the connecting device depicted in Fig. 3 the clamping collar 2 is divided into two sections axially separate from one another, and specifically into an axially inner function section 2A and an axially outer actuation section 2B. The function section with the arresting tongues 6 performs the arresting function and the release function, while the actuation section 2B serves for the axial displacement of both sections 2A, 2B from the axially outer arresting position depicted in Fig. 3 into the axially inner starting position, in which the pipe 4 is again released from the arresting tongues 6. Between the front sides facing one another of function section 2A and actuation section 2B a circumferential seal, implemented as an O-ring seal 25, is disposed, which provides sealing radially outwardly against the inner wall surface 10 of the coupling body 1 and radially inwardly against the outer wall surface 11 of pipe 4. The O-ring seal 25 is therewith located relatively close to the recess inlet 7 and axially outside the possible scratches, which can be generated at sharp edges 16 of the arresting tongues 6 in the outer wall surface of pipe 4. The sealing against the penetration of moisture and dirt, on the one hand, and against leaks of the fluid to the outside is therewith reliably ensured, although only a single O-ring seal 25 is required.

The actuation section 2B comprises at its axially inner end radially displaceable latching tongues 26, distributed uniformly over the circumference, which are separated one from the other by axial slots 27. The preferably resiliently elastic latching tongues 26 can engage with a projection 28 directed radially outwardly into an inwardly open circumferential groove 29 in the inner wall surface 10 of the coupling body 1.

The circumferential groove 29 is of a width which permits the axial displacement of the actuation section 2B to an extent that the function section 2A is displaceable between its axially inner starting position and its axially outer arresting position and conversely.

In this embodiment the function section 2A can be comprised of metal and the actuation section 2B of an elastically compliant material, such as a synthetic material. The metallic implementation of the function section 2A ensures the reliable arresting and releasing function of the latching [*sic: arresting*] tongues 6, while the actuation section 2B serves only for the actuation function and cannot be lost. As depicted in Fig. 3, in this case the circumferential flange 18 is provided on the actuation section 2B.

List of Reference Symbols

1	Coupling body
2	Clamping collar
2A	Function section
2B	Actuation section
3	Recess
4	Pipe
5	Stop
6	Arresting tongue(s)
7	Recess inlet
8	Outer side
9	First slope
10	Inner wall surface of the coupling body 1
11	Outer wall surface of pipe 4
12	Second slope
13	Front-side end
14	Outer O-ring seal
15	Inner O-ring seal
16	Edge
17	Tongue slope
18	Circumferential flange
19	O-ring seal
20	Sealing ring
21	Annular bead
22	Edge section [<i>sic</i> : Channel section]
23	Connection piece
24	Gap
25	O-ring seal
26	Latching tongue(s)
27	Axial slots
28	Projection
29	Circumferential groove